

The crank cheeks or webs usually have a depth equal to $i-i$ or 1.15 times the shaft diameter, and the breadth may be 0.6 to 0.65 times the diameter. The web nearest the fly-wheel bearing is usually a little thicker, say 0.7 to 0.75 of the diameter.

In the case of triple-expansion engines the crank webs for the high-pressure and intermediate-pressure cranks may be made thinner than above, as the shaft is much stronger than is necessary, especially at the high-pressure end (assuming, of course, that the power is given off at the low-pressure end), and the high-pressure and intermediate-pressure webs may have a breadth of 0.55 of the shaft diameter. Holes for lubrication are drilled through the shaft, as shown in fig. 42. This method was introduced by Messrs. Belliss & Morcom.

Governor.—The governor used with high-speed engines is nearly always mounted on a spindle fixed directly to the crank-shaft, or in some cases to an extension of the shaft, at the high-pressure end. As it acts in a horizontal position, it is, of course, spring controlled. This type is now sometimes called a "crank-shaft" governor, but formerly this term was reserved solely for governors which controlled the position of the eccentric, the regulation of speed and power thus being accomplished by an alteration to the cut-off. Weights controlled by centrifugal force and springs were used, and many attempts were made to improve the action of this type by disposing the weights in such a way that their inertia could come into play to supplement the centrifugal force, but all these types have been abandoned as being quite unsatisfactory. A large number of parts including links and joints were introduced, which rapidly wore, causing considerable lag between an alteration in the load and the adjustment of the speed.

The type of governor now universally used is mounted on a spindle forming an extension of the crank-shaft and controls the throttle valve, but in some cases the high-pressure piston valve is given a partial rotation at the same time through a relay cylinder actuated by the oil pressure system, or by mechanical means, also under

the control of the governor. The steam edge of the high-pressure piston valve is serrated, one side of the serration being parallel to the axis and the other edge being at an angle, the valve liners having ports with similar edges. The effect of rotating the valve is to increase or decrease the lap, and therefore to shorten or lengthen the period of steam admission. The lead is modified at the same time, so that with early cut-offs there may be no lead at all or even negative lead, which means, of course that when the piston is about to commence its stroke, the valve has not then opened to steam. With this gear wide regulation is not possible by alteration to the cut-off alone. It is generally limited to the range between three-quarter load and overload, the throttle valve taking charge of the lower loads.

The governor is enclosed in a casing fixed to the end of the bedplate and crank-case, and all the parts are lubricated by oil under pressure, taken from the lubricating system.

An adjusting spring attached to a fixed part of the crank-case at one end